

## Electrical Drives & Their Control

P. Pages : 2

Time : Three Hours

\*0829\*

TKN/KS/16/7479

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data wherever necessary.

- 1.** a) What are the basic requirements of electrical braking ? Explain rheostatic braking of induction motor. **6**
- b) A 4-pole, 50Hz, slip ring induction motor has rotor resistance and stand still reactance ref. to stator is  $0.2\ \Omega$  and  $1\ \Omega$  per phase respectively At full load it run at 1440rpm. Determine the value of resistance to be inserted in rotor in  $\Omega$  /ph to operate at a speed of 1200rpm load torque remain constant. Neglect stator resistance & reactance. **7**
- OR**
- 2.** a) Discuss starting and running characteristics of D.C. Motors. **6**
- b) A 2-pole series motor runs at 707 rpm when taking 100A at 85volts and with the field coils in series. **7**
- The resistance of each coil is  $0.03\ \Omega$  and that of the armature  $0.04\ \Omega$ . If the field coils are connected in parallel and load torque remains constant, Find
- a) Speed
- b) The additional resistance to be inserted in series with the motor to restore the speed to 707 rpm.
- 3.** a) Discuss different factors governing selection of motors. **6**
- b) A certain motor has to perform the following duty type. **7**
- 100HP for 10 minutes  
NO LOAD for 5 minutes  
60HP for 8 minutes  
NO LOAD for 4 minutes  
Which is repeated indefinitely. Determine the suitable size of continuously rated motor.
- OR**
- 4.** a) A 6-pole, 50Hz, induction motor has a flywheel of  $1200\ \text{kg-m}^2$  as moment of inertial. Load torque is 100kg in for 10 secs. No load period is long enough for the flywheel to regain it's full speed. Motor has a slip of 6% at a torque of 50Kg-m Find: **8**
- i) Maximum torque exerted by the motor
- ii) Speed at the end of deceleration period
- b) Explain the flywheel effect used in load equalization. **5**

5. a) What are the advantages of using PLC in industry ? Hence explain ladder programming in PLC ? **8**
- b) Explain the working of a PLC with a block diagram. **6**
- OR**
6. Write short notes on :
- i) RMS rating of electrical motor. **4**
- ii) Types of drives. **5**
- iii) Difference between PLC's and personal computer. **4**
7. a) Discuss blow out structure of contractor. Also compare AC and DC contactors. **7**
- b) What are the different methods of acceleration control of DC shunt motor ? Explain any one method with circuit diagram. **7**
- OR**
8. a) Explain star-delta starting of 3- $\Phi$  induction motor using contractors with the neat diagram. **7**
- b) Explain control and power circuit of pole changing of 3- $\Phi$  induction motor. **7**
9. a) Draw and explain speed time curve of.
- i) Main line service ii) Urban service
- iii) Suburban service **6**
- b) Explain the effect of unequal wheel diameter on parallel operation of DC shunt and series motors for traction application. **7**
- OR**
10. a) An electric train has an average speed of 42 km/hr on a level track between stops 1400m apart. It is accelerated at 1.7 kmphps and is braked at 3.3 kmphps. **7**
- Draw the speed time curve for the run. Estimate the energy consumption at the axles of the train per tonne/km. Take tractive resistance constant at 50NW per tonne and allow 10% for rotational inertia.
- b) An electric train is to have acceleration and braking retardation of 0.8 km/hr/sec and 3.2 km/hr/sec respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 sec. Find schedule speed for a run of 1.5km. Assume simplified trapezoidal speed time curve. **6**
11. a) Draw block diagram of digital control system and write flow chart of the program. **7**
- b) Compared analog and digital control of electric drives. **6**
- OR**
12. a) Which motors are required for following drives ? Explain the reason in brief. **8**
- i) Rolling Mills. ii) Cranes & Hoist work.
- iii) Refrigeration & air conditioning. iv) Paper Mills.
- b) Discuss control panel design. **5**

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